Remarks/Arguments:

Status of the Application

In the Office Action, claims 1-14 and 16-25 stand rejected. Claim 15 and the drawings stand objected to. With this amendment, the applicants amend claim 1, cancel claim 2 and add claims 26-49. Therefore, claims 1 and 3-49 are pending. The applicants also amend the specification and submit new drawings. No new matter has been added.

Amendments to the Drawings and Specification

The drawings stand objected to by the Office Action as not showing the step of "modifying engine settings to pass more HC and/or generate more CO" as in claim 10 or the features of a "light duty engine, turbo-charged direct injection engine, heavy duty engine" as in claims 20-22.

In response, the applicants amend the specification at page 7, line 20, substituting "30" for "(not shown)." The applicants also amend the specification at page 7, line 12, substituting "28" for "(not shown)." Additionally, the applicants submit amended Fig. 1, which shows a system for treating internal combustion engine gas connected to engine (28) and control means (30). Support for the amendments to the specification and drawings can be found at originally filed claims 10, 20-22; page 4, lines 3 and 31; page 6, lines 11-15; page 6, the entire fourth paragraph and page 7, lines 20-22 and 11-12. No new matter has been added.

With these amendments, the applicants respectfully request that the objections be withdrawn. Early notification to this effect is appreciated.

Characterization of Penetrante et al., US Patent No. 6,038,854 (Penetrante)

Penetrante is directed towards a plasma regenerated particulate trap and NO_x reduction system. The applicants respectfully submit that the disclosure in Penetrante emphasizes that its reduction system is non-catalytic (see abstract first line; col. 1, lines 21-22; and col. 4, lines 14 and 22-23). Penetrante teaches that NO is oxidized by *adding HC* and passing the HC/NO mixture through plasma. The NO_2 is then catalytically reduced to N_2, for example, by way of an alumina catalyst. Penetrante teaches that the rate of oxidation of NO to NO_2 by plasma increases with increasing HC addition (see col. 6, lines 28-32; col. 7, lines 29-34; col. 8, lines 23-24; col. 14, lines 7-10; and col. 14, lines 60-61).

Claims Rejections - 35 USC § 102

Claims 1-14 and 16-25 stand rejected under 35 U.S.C. § 102(e) as being anticipated by Penetrante et al. ("Penetrante"), U.S. Patent No. 6,038,854.

Regarding claim 1, the Office Action cites specific disclosures in Penetrante as anticipating the present invention. Particularly:

col. 5, lines 35-55 anticipates "i. oxidizing a substantial part of the HC;"
col. 5, lines 40-55 anticipates "treating the product of step i to oxidize NO to NO_2;"
col.11, lines 64-67 and col. 12, lines 1-10 anticipates "collecting soot;"
col. 13, lines 8-41 anticipates "combusting the collected soot by reaction with the NO_2 and possibly any O_2 left over after steps i and ii."

The applicants submit Penetrante does not disclose each and every limitation as recited in amended claim 1. Specifically, Penetrante fails to disclose catalytic oxidation of hydrocarbons which reduces their content and increases the efficiency of the subsequent NO oxidation. Withdrawal of the 102(e) rejection is earnestly solicited.

Penetrante teaches that NO is oxidized by the *addition* of HC and passing the HC/NO mixture through a plasma processor. At col. 5, lines 56-60, Penetrante clearly teaches "a simple hydrocarbon may be *supplied* to the NO_x reduction unit" to assist the oxidation of NO to NO_2 (emphasis added). The resultant NO_2 is then catalytically reduced to N_2 over an alumina catalyst. This is a completely opposite teaching to the present invention. The claims of the present invention recite the oxidation of HC's occur before the oxidation of NO because if the HC content is not decreased, the presence of HC interferes with and *reduces* NO oxidation over the second catalyst. Furthermore, the NO oxidation in Pentrante is non-catalytic. See Penetrante col. 5, lines 36-38; col.7, lines 29-31; col.8, lines 23-24; col.9, lines 1-12; col.13, lines 8-11; col.14, lines 7-17; and col.14, lines 57-59.

Accordingly, the applicants contend amended claim 1 is now in condition for allowance and appreciate early notification to that effect. The applicants also contend that dependent claims 3-15 and 25-37 are also now in condition for allowance because they depend from now allowable claim 1. The applicants, however, offer the following remarks as to the dependent claims.

Regarding the rejection of claims 4 and 17, reference number 74 in Penetrante is not a honeycomb support. It is a processor comprising silica beads of 4-10 mm each in diameter (see column 6, lines 28-34).

Regarding the rejection of claims 5 and 18, Penetrante is not directed to a honeycomb having a cell density from 100-900 cells per square inch. Penetrante is directed to a selective catalytic reduction catalyst comprising alumina having a surface area of 100-200 square meters per gram.

Regarding the rejection of claim 7, the cited passage in Penetrante actually teaches away from positioning the first catalyst or plasma oxidation step close to the engine. The closer to the engine, the hotter the exhaust gas. As properly stated in Penetrante, if the exhaust gases are at temperatures above 300°C, NO_2 decomposition occurs i.e. the equilibrium of the NO to NO_2 oxidation is thermodynamically limited, thereby reducing the efficiency of the step of combusting soot in NO_2. Claim 7, however, specifically recites that the first oxidation is carried out close to the source of the exhaust gas or close to the engine.

Regarding the rejection of claim 8, Penetrante does not teach the gas leaving step/catalyst i to cool and then enter step/catalyst ii. The applicants were unable to find any teaching at col. 6 lines 1-68 nor at col. 7, lines 1-50 that show the cooling step as recited in claim 8.

Regarding the rejection of claim 10, the Applicants were also unable to find some teaching at col. 5, lines 35-55 that discloses the step of modifying engine settings to pass more and/or generate more CO.

Regarding the rejection of claim 11, the Applicants were again unable to find some teaching at col. 8, lines 55-67 that discloses the step i catalyst having a low light-off temperature.

Regarding the rejection of claim 14, reference numeral 136 of Penetrante is a NO_x reduction catalyst (see col. 15, line 38) and not a NOx absorber placed downstream of a collecting trap.

Regarding the rejection of claim 16, the Office Action cites particular reference numerals in Penetrante as anticipating the present invention. Particularly reference numerals

(74) as anticipating "a first catalyst . . . effective to promote the oxidation of HC therein;"
(14) as anticipating the "internal combustion engine exhaust gas;"
(78) as anticipating the second catalyst to be fed with the product of i and effective to promote the oxidation of NO to NO2; and
(82) and (112) as anticipating the filter to collect soot and to retain it until it is combusted.

The applicants submit Penetrante does not disclose each and every limitation as recited in claim 16. Specifically, Penetrante fails to disclose a first catalyst to receive engine exhaust and effective to promote the oxidation of HC therein. Withdrawal of the 102(e) rejection is earnestly solicited.

Penetrante fails to disclose a first catalyst that oxidizes hydrocarbons. Reference numeral (74) is cited as anticipating a first catalyst that oxidizes hydrocarbons. Reference numeral (74) is described at col. 6, line 29-32 as "[a] processor 74 is held in place by a metal bulkhead 76 uses both the simple hydrocarbons and a non-thermal plasma to convert NO in the flow from the engine exhaust inlet 56 into NO_2." Alternatively, reference numeral (74) is described at col. 6, lines 43-44. "Such a processor [74] is known to artisans as a dielectric barrier discharge processor." Clearly, reference numeral (74) is not a catalyst that oxidizes hydrocarbons, as called for by claim 16.

Accordingly, the applicants contend claim 16 is in condition for allowance and appreciate early notification to that effect. The applicants also contend that dependent claims 17-25 and 38-49 are also in condition for allowance because they depend from allowable claim 16.

Summary

In view of the foregoing amendments and remarks, the applicants contend that this application is in condition for allowance and respectfully request early and favorable notification to that effect. If it would expedite prosecution of this application, the Examiner is invited to confer with applicants' undersigned attorneys.

Respectfully submitted,

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CMB/pb
Attachments Figure 1 (1 sheet)

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